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MESOZOIC.—In examining the microscopic structure of the flint nodules found in the Lower Cretaceous of Texas near Austin, Mr. J. A. Merrill found traces of the following organisms: Foraminifera, sponges, molluscs represented by the nacreous tissue of the shells, and fishes represented by their scales. The fact that the delicate spines of the sponge spicules, even to the most minute barb are perfectly preserved, showing no trace of having been subjected to mechanical movement, leads to the conclusion, that these flints result from the continuous growth of sponges *in situ.* Mr. Merrill's study then confirms to this extent the view taken by Prof. Sollas in his study of the nodules of the English flint. (Bull. Harvard, Mus. Comp. Zool., Vol. XXVIII, 1895.)

CENOZOIC.—Mr. G. H. Ashley's studies of the Coast Range Mts. of California lead him to the conclusion that the east and west ranges of Santa Barbara, Ventura and Los Angeles counties were elevated at about the end of the Miocene, while the ranges to the north with a uniform strike of northwest and southeast were elevated at or near the end of the Pliocene. (Geol. Mag., Vol. III, 1895.)

Mr. A. M. Edwards reports Cenozoic clay containing marine forms of diatomaceæ from Rockaway, Long Island. The clay deposit is dark green or grey in color, and is capped by a fresh water deposit of white clay. (Observer, Dec., 1895.)

Prof. H. L. Fairchild enumerates eight reasons for regarding the Pinnacles Hills, near Rochester, N. Y. as a kame series forming a part of a frontal moraine. This is contrary to the views of Upham who considers that they were deposited "in the ice-walled channel of a stream of water," "open to the sky." (Amer. Geol., Vol. XVI, 1895.)

## BOTANY.[1]

**A recent paper on the relation between the Ascomycetes and Basidiomycetes.**[2]—In the October number of the *Revue Mycologique* under the heading "A Fungus simultaneously an Ascomycete and Basidiomycete" appears a résumé by R. Ferry of a portion of a paper published in *Mémoires couronnés de l'Académie de Belgique,* 1894 by Ch. Bommer. I have not seen the original paper, but as Ferry gives quite a lengthy account of it and quotes the most essential parts there seems to be sufficient basis for some remarks.

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[1] Edited by Prof. C. E. Bessey, University of Nebraska, Lincoln, Nebraska.

[2] Read before the Botanical Seminar of the University of Nebraska, Dec. 21, 1895.

The fungi under consideration are *Mylitta australis* Berk. and *Polyporus mylittæ* Cooke and Massee. The former is a large irregularly spherical hypogeous fungous growth found in Australia and Van Diemans' Land and called by the inhabitants "native bread." It was first described by Berkeley in *Ann. and Mag. of Nat. Hist.,* 1839 and referred to *Mylitta,* a doubtful genus established by Fries upon what is now known to be a gall. Berkeley says he found no spores but noticed that the ends of some of the hyphæ were swollen. No one seems to have examined the fungus for some time after Berkeley described it. According to Ferry, Tulasne regarded it as a mycelial formation analagous to *Pietra fungifera* of Battara and older writers, which is now known to be the sclerotium stage of *Polyporus tuberaster* Fr. Later Cooke and Massee[3] referring to the plant incidentally call it a sclerotium and Saccardo[4] who examined it recently, says he observed spores (?) which were globose, smooth, hyaline, plainly nucleate and 14–15$\mu$. in diameter. Such in brief was the knowledge of the plant before the appearance of the paper under discussion.

The latter plant *Polyporus mylittæ* C. & M. (fig. 1) was first described in *Grevillea* l.c. It is a short stipitate plant with a tough pulvinate pileus about 10 cm. broad, found growing on *Mylitta australis* in southern Australia. The authors say in a note; "A most interesting production, undoubtedly the ultimate development of the sclerotium long known as *Mylitta australis* Berk."

A year later Saccardo (l. c.) published a slightly different form of the same fungus under the same name. After the description he adds: "Growing on *Mylitta australis* from which it appears to originate. The texture of the *Polyporus* and of *Mylitta* are about the same. They are formed of intertwining filaments with frequent globose swellings constituting a soft or suberose white mass. It is very probable, therefore that *Mylitta* is the sclerotium form of the *Polyporus* and probably bears the same relation to the *Polyporus* that *Ceriomyces* bears to *Polyporus biennis* (Bull.) Fr."

Referring now to Bommer's paper we shall give the essential parts of Ferry's summary and translate the important parts of the quotations from the author. Ferry first gives an account of *Mylitta australis* as observed by Bommer.

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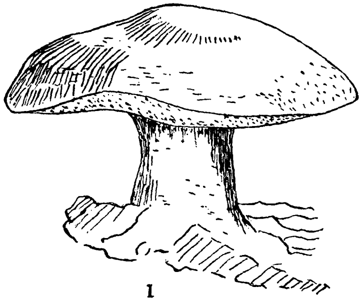
[3] Cooke and Massee. Grev., **21** : 37. Dec., 1892.

[4] Saccardo. Hedw., **32** : 56. March and April, 1893.

Specimens are compact, very hard and covered with a superficial black crust. In full grown plants the interior is divided into a number of irregular cavities. The walls of these cavities are formed of a white tissue which under the microscope is seen to consist of thick-walled hyphæ which are stained by Bismark brown (fig. 2 b.). These hyphæ are from 4–8$\mu$. in diameter. The cavities soon become filled with a gelatinous substance of a horny consistency in which some thin, hyaline, flexuose hyphæ are found buried. These are not colored by Bismark brown. Some of these hyphæ have ovoid swellings 5–8$\mu$. long near their ends which contain 1, 2 or 3 ovoid bodies with very thin walls. Each body contains a kind of nucleus. Later these swellings (fig. 2 a.), especially those near the periphery of the gelatinous mass increase in size and contain only one ovoid body. This is brown, verrucose, very refringent, presenting all the characters of a spore and is regarded as such by Bommer. Since he finds what he considers asci and spores he refers *Mylitta australis* to the Tuberaceæ. He describes the mature asci and spores as follows: "The asci (fig. 3) are analagous to those of *Tuber melanosporum,* being ovoid or spherical and 40–50$\mu$. in their greatest diameter. The membrane is thin and encloses a single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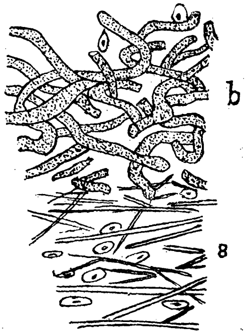

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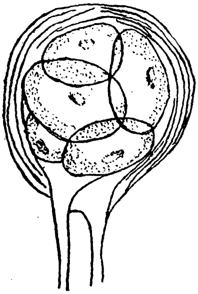
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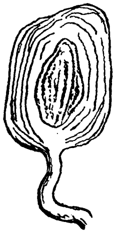
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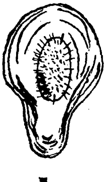
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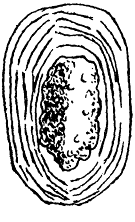
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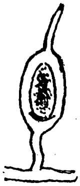
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elongated hyaline spore 20–30$\mu$. long which is either smooth (fig. 4), verrucose (fig. 6) or echinulate (fig. 5)."

Nearer the centre of the gelatinous mass he says the asci are less plainly differentiated and frequently contain no spores (fig. 7). He submitted the fungus to chemical tests and found a great abundance of cellulose, but no glycogen, a substance usually present in Tubers.

The ordinary structure of the plant is, according to the author, as described above. As to its relation to *Polyporus mylittæ* which is frequently found growing from it, he says: "A specimen from the British Museum removes all doubt. This specimen like many others has a central cavity on one of the walls of which is seen a pulvinate mass formed by the hymenium of *Polyporus mylittæ.* This pulvinus does not possess true pores, but only small hemispherical cavities on its surface and numerous small rounded closed cavities in its interior which are covered by the hymenium. The mass ef hyphæ which forms the base of this hymenium is identical with the opaque white tissue which composes the walls of the cavities of nearly mature examples of *Mylitta.* Notwithstanding the presence of the pores and the thicker and more crowded hyphæ disposed after the manner of palisade tissue so characteristic of the hymenium of ordinary Hymenomycetes, the specimen is unfortunately sterile.

The particular disposition of the hymenium and the continuity and identity which exists between it and the sterile tissue of *Mylitta* establishes the fact that there exists between *Mylitta* and the *Polyporus* an intimate relation of the same nature as that which exists between the different stages in the life history of many fungi. Hence it follows that a carpophore of a Hymenomycete (*Polyporus mylittæ*) is here in reality the conidiophore of an Ascomycete (*Mylitta australis*). If this conclusion is true in the present case, it ought to be admitted that this is the relation which exists in general between the Basidiomycetes and Ascomycetes." ! ! !

Such are the author's preposterous conclusions, and thus is the autonomy of the Basidomycetes calmly disposed of.

One's first impulse is that this is a huge joke, but when you reflect that it emanates from the Belgian Academy of Sciences and is tacitly accepted by Ferry one of the editors of the *Revue Mycologique* the matter takes a serious aspect and it seems necessary to file a protest.

Ferry adds that DeBary long ago expressed the opinion that the Basidiomycetes and Uredineæ may be conidial forms of Ascomycetes. The only statement I find in DeBary[5] touching the point comes far from endorsing such an idea. The reviewer says further that Brefeld admits, theoretically, the existence of such fungi, but does not admit their actual existence because he does not think that two reproductive bodies of such complex development are able to be produced simultaneously. This idea Ferry regards as explaining the imperfect development of the *Polyporus* in Bommer's plant, and he adds, with a profundity equal to that of the author himself, that there are no existing characters which permit the plain separation of conidial bearing basidia (conidiophores) from typical basidia.

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[5] DeBary, Comp. Morph. and Biol. of Fungi (Eng. trans.), p. 341.

As to the author's observations, if accurately made they are of course deserving of consideration. We have not the space nor is it our purpose to discuss them here. Were it not for the fact that the normal form of *Polyporus mylittæ* is frequently found growing on *Mylitta,* and is regarded by several observers as being genetically connected with it, we might possibly disregard the supposed sterile hymenium and accept *Mylitta* as a tuber, though several of the author's observations are at variance with the characters of any known tuber. I am inclined for the present, however, to accept Tulasne's opinion and regard *Mylitta* as a sclerotium or a conidial stage of the *Polyporus.* As to the asci they may be illusions or may belong to some parasitic fungus. This is mere conjecture, however. These fungi are interesting forms and it is hoped that their study may be continued until the author's observations are confirmed or rejected. Accurate observations are always welcomed by botanists, but gratuitous and unfounded conclusions and generalizations should find no place in botanical literature.—C. L. SHEAR.

**Polyporaceæ, Hydnaceæ, Helvellaceæ.**—The undersigned desires species of the above groups from all parts of North America for the purpose of accumulating materials from which to monograph these families. In sending specimens, good representatives are desired, not mere fragments or abortive specimens. Where possible, indicate the host on which the fungus grows if a lignatile species, and especially in the case of fleshy or semi-fleshy forms, it is desirable to note the characters in a fresh condition. Even the most common species are desired in order to determine geographic distribution. When it is remembered that not a single species of any of these groups has been reported from more than half of our states and territories, it will be seen how great the necessity of coöperation on the part of local botanists and botanical collectors in order that this preliminary monograph may be as fairly representative of our flora as possible.

Before sending large packages, a preliminary correspondence will be desirable in order that the package can be sent the cheapest way. So far as possible, specimens will be named for contributors and in all cases full credit will be given.—Lucien M. Underwood, Auburn, Ala.

**The Smut of Indian-Corn** (*Ustilago zeæ-mays*).—It has been found out at the Indiana Experiment Station that the smut does not attack the plant through the seed as has been supposed but like wheat rust it starts in the leaves and stems, wherever the spores are carried by the wind and find lodgment and sufficient moisture to enable them to germinate. The spores will grow as soon as ripe, that is as soon as the mass containing them turns black, and they will also retain their vitality for a year or two in case conditions for growth are not favorable.

It is evident from this that neither the time of planting nor the previous condition or treatment of the seed will have any effect upon the amount of smut in the crop. It is equally evident that meteorological conditions will have decided influence. Two things can be done to decrease smut in corn. The growing crop can be sprayed with a suitable fungicide and the entrance of the smut into the plant prevented. That this can be made effective is shown by experiments at the Indiana station. The other, more convenient but less thorough, method, is to gather and destroy the smut, and thus eventually rid the fields of it.—(*Bull. Ind. Station.*)

**Antidromy and Crossfertilization.**—I have been much interested in Dr. Macloskie's article on Antidromy in the November number of The Naturalist. It reminds me of some observations which I made several years since while investigating the subject of crossfertilization. They will be found recorded in the same journal August, 1880. A suggestion is ventured as to the possible cause of it in the flowers of *Saxifraga sarmentosa* on pages 573 and 574 of that number. In that case it seems to have little or no value in aiding crossfertilization.

Other cases, however, have been noted where it seems probable that it may be of essential value in that direction, viz., in *Solanum rostratum* and *Cassia chamaecrista.* They show lateral asymmetry, by which the pistil is on opposite sides, in successive flowers of a cluster. These plants will be found described also in The American Naturalist, April, 1882.

It may be an item of general interest, also, that the features of the flowers there pointed out are so remarkable as to have attracted the attention of Darwin. He addressed a letter of congratulation and inquiry to the writer with his characteristic candor and cordiality. It may have been the last letter from that illustrious hand, for he lay cold in death before the missive had reached its destination. He called attention also to the fact that he had observed similar asymmetry in *Mormodes ignea* and had similarly used the terms " right handed " and " left handed." The fact is published in his " Fertilization of Orchids." —J. E. TODD.

*University of South Dakota, Vermillion, S. D., Dec.* 2, 1895.

## VEGETABLE PHYSIOLOGY.

**Water Pores.**—Dr. Anton Nestler contributes an interesting " Kritische Untersuchungen über die sogenannten Wasserspalten " (pp. 38, pl. 2) to Band LXIV, No. 3 of *Nova Acta d. Ksl. Leop.-Carol. Deutschen Akad. d. Naturforscher.* The term " water pore " was introduced by DeBary to designate a mechanism supposed to be distinguished from ordinary stomata by (1) Presence of liquid water, at least at times, in the substomatic opening; (2) Rigid guard cells; (3) Often very considerable differences in form and size; (4) Location near the edge of the leaf in the teeth over the end of a vascular bundle. The following subjects are considered in this paper: Previous literature; development of the water pores; structure, number, and size; rigidity of the guard cells; plants destitute of water pores. Dr. Nestler shows that water pores originate from stomatic mother cells in the same way as ordinary stomata (48 species of Ranunculus were examined and also plants of many other families); that while water pores sometimes exceed ordinary stomata in size they are quite as often of the same size or smaller, and frequently show plain transitions into the latter; that rigidity of the guard cells is not always present in the water pores nor always absent in ordinary stomata; that water pores sometimes discharge vapor of water; and, finally, that the ordinary stomata sometimes, and probably often, excrete liquid water (over the whole upper surface of the leaf in *Vicia Faba*).—ERWIN F. SMITH.

**Biology of Smut Fungi.**—The third part of Dr. Brefeld's Smut Fungi (Heft XII of the *Untersuchungen*) contains 140 pages of quarto text and 267 figures packed into 7 lithographic plates, the crowding together of which makes difficult the comparison of text and figures. All told 13 genera and 64 species are described, of which latter 22 are reckoned as new. The germination of the smut spores is figured for most of the species as well as described. The descriptions are long and include a wealth of biological detail drawn from the behavior of the